



COPAG RFI Submissions

Executive Summaries

Paul Scowen (ASU)

STARS

- Ted Gull (GSFC) - How do molecules and dust form in the interacting winds of massive stars? - larger aperture OIR telescope w/ imaging spectroscopy, better 3-D modelling of wind-wind interactions
- Ian Roederer (Carnegie) - Detect and measure as many heavy elements as possible in stars whose atmospheres retain a fossil record of the evolution of the ISM – high resolution FUV spectroscopy over wide fields
- Myron Smith (STScI) – The dedicated measurement of stellar magnetospheres, winds, activity and environment of a variety of types over time; UV and visible spectroscopy; UV and visible spectropolarimetry
- Richard Ignace (ETSU) – The use of polarimetry as a probe of geometry, opacity and magnetic fields associated with a variety of problems in stellar astrophysics, w/ time series capability
- Ken Carpenter (GSFC) - Mass Transport Processes and their role in the Formation, Structure, and Evolution of Stars and Stellar Systems – development of a dramatic increase in ang. resolution to the sub-mas level – UVO spectral imaging to resolve stellar surfaces and environments using large diameter (0.5-1.0km) sparse aperture telescopes

STAR FORMATION AND NEARBY GALAXIES

- Paul Scowen (ASU) – A wide field UVO imaging survey of massive star forming complexes – to understand the formation mechanisms and survival rates of the star formation process – wide field ($>10'$) UVO imaging with diffraction limited ($0.04''$) resolution
- Paul Scowen (ASU) - how are chemical elements distributed and dispersed into the CGM and IGM? How does baryonic matter flow from the IGM into galaxies and then stars and planets? - high resolution multiband UVOIR imaging survey of the Magellanic Clouds; a narrowband survey of HII regions and the diffuse warm ISM; a FUV spectroscopic survey of 1300 early-type stars
- Aida Wofford (STScI) - Massive Stars: key to solving the cosmic puzzle - how do mass, composition, convection, mass-loss, rotation rate, binarity, magnetic fields, and cluster mass affect massive stars and their feedback mechanisms? – UV spectroscopy of a statistical significant sample of OB stars in the MCs; UVO imaging and spectroscopy of large sample of local SF galaxies to study escape of Ly α
- Martin Barstow (U. Leicester) - Conditions for Life in the Local Universe - how does cosmic feedback affect habitability – physics of hot atmospheres, changes in interplanetary environment? - need larger samples of targets, ultra-high FUV spectroscopy and widefield FUV imaging

STAR FORMATION AND NEARBY GALAXIES (2)

- Tom Brown (STScI) - The History of SF in Galaxies - photometry of resolved stellar pops in nearby galaxies to directly measure SF histories, separating components and structures within a galaxy – 8m telescope widefield UVO imaging
- Paul Goudfrooij (STScI) - Space-Based UVO Widefield Imaging and Spectroscopy: Near Field Cosmology - use of GCs to provide a fossil record of earlier SF era – ability to measure GC properties to provide access to outer halo SF history – widefield diffraction limited UVOIR imaging
- Ben Williams (U.Washington) - The Crucial Role of High Spatial Resolution, High Sensitivity UV Observations to Galaxy Evolution Studies - to understand how the diverse array of present-day galaxies came to be? How does SF proceed in different environments? - use of SED fitting in the UV to split degeneracies in reddening and temperature using UV-bright hot stars – widefield UVO imaging

INTERGALACTIC MEDIUM

- Todd Tripp (U. Mass) - QSO Absorption Lines in the FUV: An Untapped Gold Mine for Galaxy Evolution Studies - use of QSO absorption lines to probe the invisible baryons – challenges: the useful lines are in the UV, most QSOs are too faint - go deeper, in the EUV – high res. FUV spectroscopy
- Stephan McCandliss (JHU) - Project Lyman: Quantifying 11 Gyrs of Metagalactic Ionizing Background Evolution - How did the universe come to be reionized and how long did it take? - How did LyC and Ly α escape from galaxies? - Far-UV has the advantage of small number of Ly limit system corrections → need to measure the Evolution of the Galaxy UV luminosity function for $0 < z < 3$
- Mike Shull (U. Colorado) - Identifying the Baryons in a Multiphase Intergalactic Medium - What is the census of baryonic matter in the low redshift universe? Where are the “missing baryons” and how do they affect galaxy assembly and ongoing star formation? – Deep FUV high-res. spectroscopic surveys, 6-8m aperture

INTERGALACTIC MEDIUM (2)

- Claudia Scarlata (U. Minnesota) - The Role of Dwarf Galaxies in Reionization – use of lensing magnification as the best and only way to study the faint galaxies that contribute to LyC budget – FUV widefield imaging and spectroscopy
- Chris Martin (Caltech) – Science from IGM/CGM Emission Mapping – can be used as a probe of baryonic structure formation – detect and characterize IGM emission; physical properties of the IGM; tracing baryonic structure formation using IGM emission – FUV MOS spectroscopy over modest fields
- Gerard Kriss (STScI) - Synergistic Astrophysics in the UV using AGNs - how do BHs accrete matter and grow over time? Use of AGN as backlights for IGM, CGM and ISM studies. Reverberation mapping of the BLR, quantify outflows, radiation reprocessing – requires high-res. (ang. and spect.) FUV spectroscopy

GALAXY EVOLUTION

- Brad Peterson (Ohio State) - UV Time Domain Studies of Active Galactic Nuclei - Intensive monitoring to get UV velocity-delay maps to establish flow of high-ionization gas - UV reverberation mapping of AGN BLRs – requires high cadence
- Steve Kraemer (CUA) - AGNs and their role in Galaxy Formation and Evolution - Probing the inner structure of AGN – requires optical/UV imaging at sub-mas resolution - can only be achieved with space-based long-baseline (0.5-1.0 km) observatories: interferometer (UVOI)
- Matthew Hayes (U.Toulouse) - Extragalactic Lyman- α Experiments in the Nearby Universe - Using Lyman- α to probe the lowest mass galaxies, the cosmic web, dark clouds, Pop III stars - UV (150-360nm) survey telescope ($>0.1 \text{ deg}^2$): slitless spectroscopy (R=100, 5000)
- Paul Scowen (ASU) - Galaxy Assembly and SMBH/AGN Growth - How did galaxies evolve from the very first systems to the types we observe nearby? - objects at $z>7$ are very faint and very rare – need widefield imaging and diffraction limited optics - evolution of the faint-end slope of the dwarf galaxy luminosity function, tracing the reionization history using Ly- α emitters
- Sally Heap (GSFC) - A UVOIR Spectroscopic Sky Survey for Understanding Galaxy Evolution - to understand how galaxies evolved to form the Hubble sequence and to establish which processes were responsible - conduct a 0.2-1.7 micron spectroscopic survey of 10^6 galaxies at $z>0.8$

OTHER SCIENCE

- Charley Noecker (JPL) - Exoplanet Science of Nearby Stars on a UVO Astrophysics Mission – characterize planetary systems, formation mechanisms - UVO detection and characterization of rocky planets – with a flagship of 4m diameter or larger w/ internal coronagraph and external starshade
- Kevin France (U. Colorado) - From Protoplanetary Disks to Extrasolar Planets - to study inner regions of protoplanetary disks (<10AU) – planet formation timescales $\sim 10^6$ - 10^7 yrs; gas disk lifetimes and structure determine how planets form gas envelopes and determine final architecture of exoplanet systems – FUV/NUV MOS/Echelle spectroscopy
- Mike Wong (UCB/U. Michigan) - Solar System Science Objectives with the next UVO Space Observatory – to provide a local reference point for origin and evolution of stars and planetary systems – requires moving target tracking, ability to resolve time variable phenomena - UVO imaging and spectroscopy

OTHER SCIENCE

- Ana Gomez de Castro (UC Madrid) - Seeking Behind the Anthropic Principle - metallic evolution of the IGM, physics and contents of galactic haloes, evolution of UV irradiated environments and emergence of life – need more spectroscopic lines of sight, narrow band UV imaging and spectroscopy, large collecting area, large photon-counting detectors, coatings, UV optics materials, UV survey of the Galactic plane, better molecular transitions database
- John Hutchings (CSA) - CASTOR – a widefield UVO survey telescope with 0.15” resolution - provides a wide field for high resolution surveys; supports DE/DM science; some PI programs envisioned; includes slitless spectroscopy - looking for partnerships, design exists, need to start Phase A studies, work on optical design - current design is off-axis TMA w/ imaging bands in UV, u and g
- Jason Tumlinson (STScI) - Unique Astrophysics in the Lyman UV - the Lyman UV provides a rich suite of diagnostics unavailable in any other passband - use of this waveband provides access to the CGM and enlarge the target sample – requires an 8m telescope – additional science: chemical abundances in star forming galaxies; effect of UV on exoplanet biosignatures; reionization and the escape of ionizing radiation

“INVERSE NEFF”: MAPPING CAPABILITIES TO SCIENCE ENABLED - IMAGING

Parameter	Enabled	Not Enabled	Best Bang for Buck?
Waveband:			
≥ 92nm	18	0	
≥ 115nm	11	5	✓
≥ 250nm	4	13	
Resolution:			
≥ 1 mas	13	3	
≥ 10 mas	12	4	✓
≥ 50 mas	8	8	
Aperture:			
1-2m	7	10	
2.4m	11	6	✓
4m	12	5	
8m+	16	1	
FoV:			
1 arcmin	5	12	
10 arcmin	11	6	✓
30 arcmin	15	2	

“INVERSE NEFF”: MAPPING CAPABILITIES TO SCIENCE ENABLED - SPECTROSCOPY

Parameter	Enabled	Not Enabled	Best Bang for Buck?
Waveband:			
≥ 92nm	22	2	✓
≥ 115nm	13	11	
≥ 250nm	2	22	
Spectral Resolution:			
R=1000	9	15	
R=10,000	16	8	
R=40,000	18	6	✓
Aperture:			
1-2m	6	18	
2.4m	12	12	
4m	16	8	✓
8m+	20	4	
MOS:	8	N/A	